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ANALYTICAL METHODS

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A ROUTINE METHOD FOR ELEMENTAL ANALYSIS OF DRINKING WATER BY ICP-MS

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The analysis of Ontario's drinking water is one of the major responsibilities of the Ministry. Monitoring of elemental concentrations in drinking water is necessary to protect the public. The data is then used by environmental scientists for various studies.

As information concerning affects of different chemical compounds on the environment grows, so does the need to measure analyte concentrations at lower levels.

Many analytical methods have been developed in our laboratory using different instrumentation to measure elemental concentration levels in drinking water samples. In the past this instrumentation provided sufficient analyte detection capability.

Today there is a demand for lower detection limits. To achieve this many of the incoming samples are preconcentrated to gain sufficient analyte detection.

Inductively coupled plasma mass spect metry (ICP-MS) is a relatively new technique which has proven its detection capability for many elements in the parts per trillion level. Using this technique for analysis of drinking water samples allows the elimination of a time consuming preconcentration step and simplifies analysis by reducing the number of analytical methods used.

Elemental concentrations measured with the ICP-MS are Be, B, Al, Ti, V, Cr, Mn, Fe, Ni, Co, Cu, Zn, As, Se, Sr, Mo, Ag, Cd, Sb, Ba, Tl, Pb, and U. Detection limits are <.1 ng/ml for most elements.

The effects of spectral interferences have been investigated and corrected.

Accuracy and precision (long and short term) measurements have been made.

Calcium and magnesium form refractory oxides in the source. At high concentrations this chemical interference or matrix effect can cause inaccuracy of analyte measurements. Ontario's drinking water has varying concentrations of Ca and Mg. A suitable correction procedure has been incorporated into the method to eliminate this affect.

An instrument comparison has been conducted between ICP-MS and existing instrumental methods (ICP-AES, GFAAS, Hydride-AAS, and Fluorescence).

A quality control protocol has been established for maintaining the integrity of the data.

Software applications have been written to automatically check the results for accuracy and to transfer the data to our laboratory information management system.